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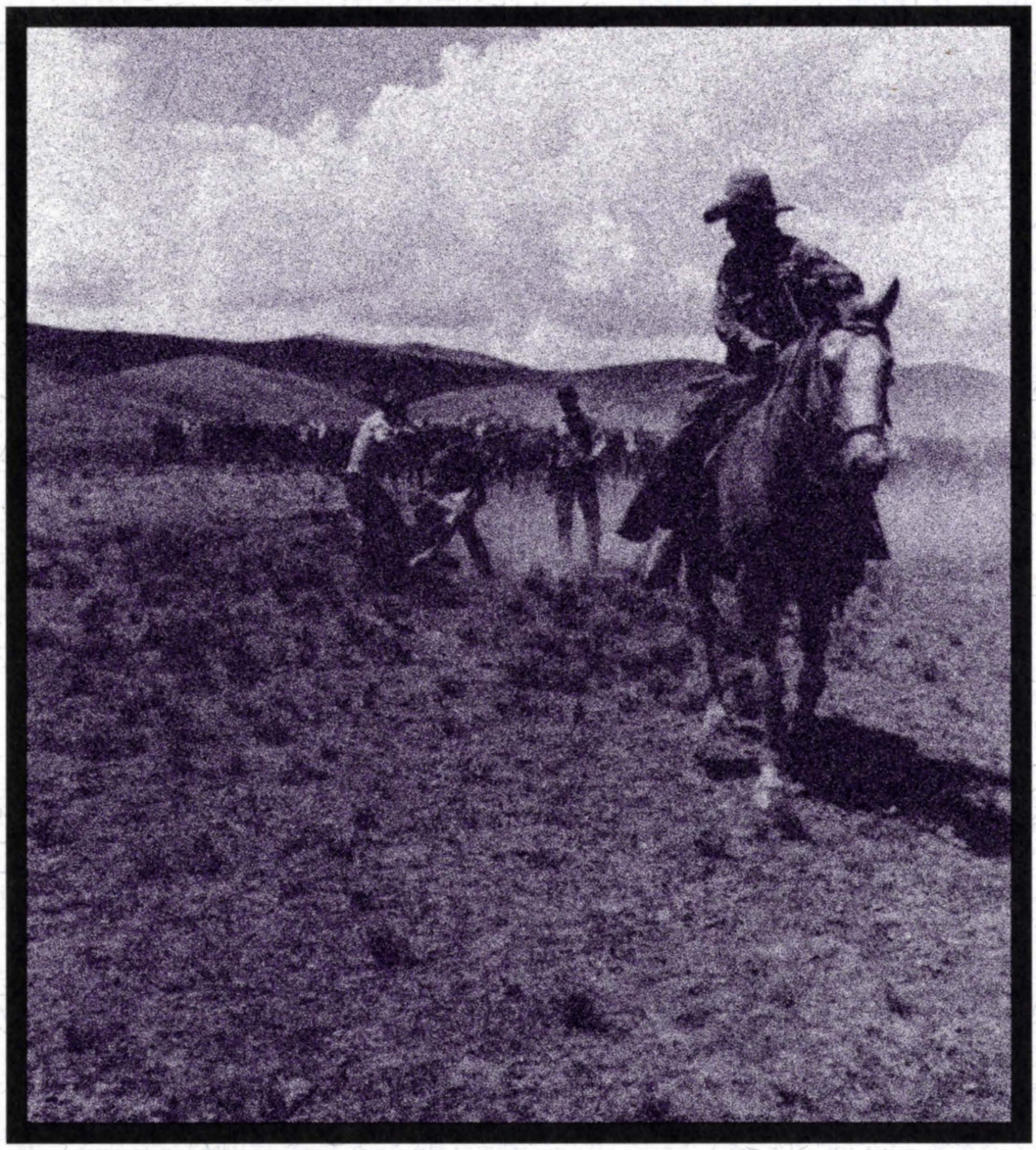

UTAH SCIENCE

VOLUME 56 NUMBER 3 FALL 1995

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Gary Neuenswander

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UTAH SCIENCE

Photo: Barrie Gilbert

Wildlife in the West—Getting Too Close for Comfort?

It's not quite the wild and woolly West anymore. Instead of stalking game in the wild, wildlife often venture into urban or suburban terrain, and the results—goose droppings on golf courses, deer browsing shrubs, raccoons rummaging in garbage cans—often offer more nuisance than adventure. Other close encounters, such as deer-car collisions and wildlife-borne diseases, offer excitement but the wrong type of risk.

Wildlife can also be expensive interlopers in crops and orchards.

These episodes tax our tolerance of wild creatures and take a huge toll on wildlife. Moreover, they're costly. Wildlife cause several billion dollars in damage annually in the United States.

These problems are likely to increase as humans encroach on wildlife terrain and as wildlife adapt to human-managed environments, scenarios which are becoming increasingly common in Utah. Fortunately, much of this damage may be unnecessary or avoidable, according to Michael Conover, director of the USU Berryman Institute of Wildlife Damage Management, which was created two years ago.

The Institute acts as a liaison between natural resource agencies and wildlife researchers to find ways to reduce detrimental encounters between humans and wildlife. Research encompasses many kinds of wildlife and situations, and currently includes such topics as the management of urban deer, contraceptives for wildlife, the ecology of feral cats, bird predation on hatchery trout, and predation by coyotes.

phony eggs and unpalatable ground covers

Conover's research employs a variety of methods. He reduces predation on the eggs of ground-nesting Caspian terns and ducks by placing dummy nests containing mint-flavored eggs at likely nesting sites. Predators that snatch the phony eggs despise the flavor, and will be unlikely to snatch eggs when birds start nesting.

Ground cover can be a key factor in controlling wildlife damage, Conover said. The lush grass in residential areas and orchards often attract foraging wildlife. One solution—redirect wildlife to more suitable areas by planting an unpalatable ground cover.

One promising ground cover that Conover studies is a type of fescue planted on almost 20 million acres in the Eastern United States. The forage contains a fungus (an endophyte) that spurs plant growth but adversely affects livestock. The fungus may have the same effect on many pesky mammalian herbivores, including voles that girdle and kill fruit trees in orchards.

Planting fescue as a ground cover in orchards may deter these small mammals. Preliminary experiments show higher mortality among voles eating a diet rich in fungus-infected fescue. Further research will determine whether fescue affects their habitat preferences.

The fungus-infected fescue may have other applications, such as keeping birds from frequenting areas near airport runways, thereby reducing the risk of bird-aircraft collisions.

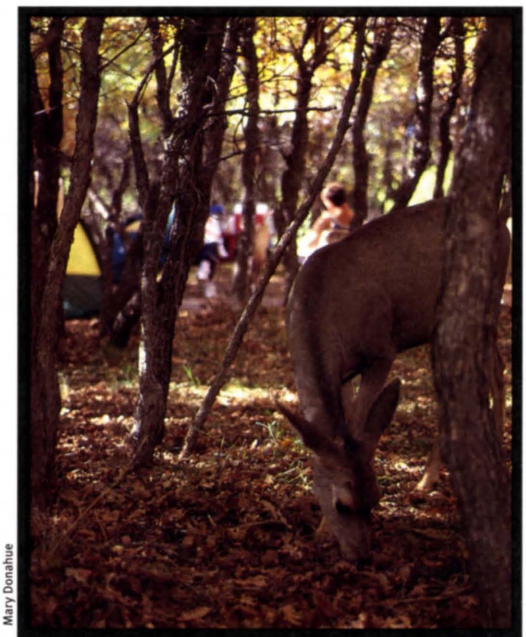
Fungus-infected fescue may have a down side, however, if its effects on beneficial wildlife are similar to those on livestock. "This fescue may represent a hazard to wildlife, although we don't yet know the extent," Conover said.

Of particular concern is the harm to birds that ingest fescue seeds. Mortality among chickens on diets containing infested fescue seeds was much higher, especially when chickens experienced stress, than among chickens fed uninfected seeds.

It's uncertain whether wild birds are similarly affected because they may avoid these seeds if other feed is available.

billions in damage

Conover and other researchers recently estimated that wildlife damage in the United States exceeded $2.9 billion annually, which was probably only a fraction of actual losses since many types of losses aren't reported or can't be quantified.



Mary Donahue

A deer feeds within a few feet of campers in Mesa Verde, southwestern Colorado.

Included in the loss column were more than 700,000 deer-vehicle collisions annually causing more than 200 human fatalities and more than $1.1 billion in damage.

Losses to agricultural production is $500 million. Aircraft-bird collisions cause several fatalities annually and about $200 million in damage.

Approximately 75,000 people in the United States. are injured or become ill due to wildlife collisions, bites or wildlife-transmitted diseases each year. Wildlife also extensively damage forests and household landscapes.

Americans clearly value wildlife, Conover said, but not when they wander into cars, devour haystacks, or forage in gardens. Research can help humans and wildlife coexist harmoniously. **KG**

MORE INFO

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Compound Makes Rangeland Plants Tastier to Livestock

Remember the ditty about a little bit of sugar making the medicine go down? Well, this stuff is similar, only it encourages sheep and cattle to head for unpalatable trees and shrubs, potentially doubling or tripling the productivity of many types of rangelands.

The change in grazing preferences is due to a harmless and inexpensive compound that neutralizes many of the harmful compounds produced by shrubs and trees. The result—a much more varied and productive smorgasbord for livestock on millions of acres of pastures and rangelands around the world, including hundreds of thousands of acres in the Intermountain region.

"We know it (the compound) works. I've seldom seen such a strong response during research. As far as I'm concerned, it's the closest thing to a 'magic bullet' as we can get," says USU range scientist Fred Provenza, who has studied the compound for 2 years.

The cost—pennies per day.

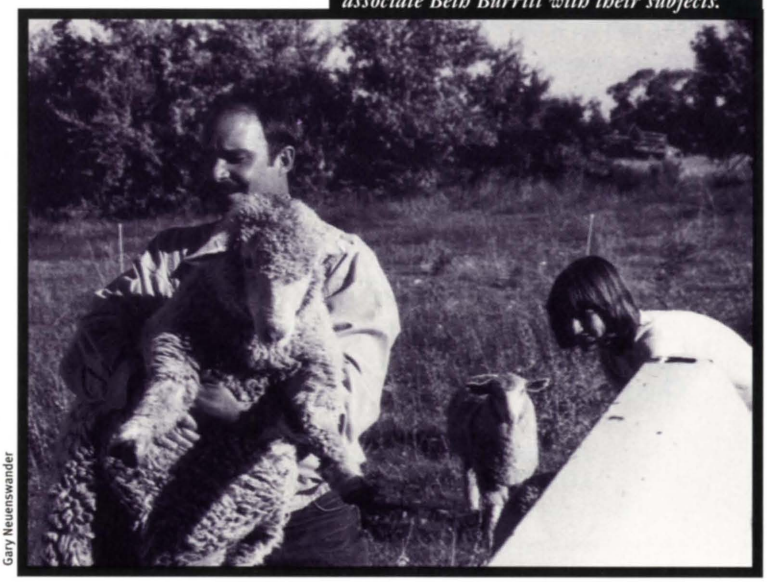
Provenza is cooperating with researchers in Israel who have conducted extensive studies of the compound, polyethylene glycol (PEG). Providing supplemental PEG once a day increased birth weight of lambs and kids, and weight gain and milk yield of sheep and goats grazing Mediterranean scrub land. Similar responses have been noted in USU studies.

Research is now focusing on whether livestock self-regulate their intake of the compound. If they do, it would simplify management and cut costs for producers.

PEG is a nearly tasteless and odorless compound widely used in industry for hundreds of purposes, including water-soluble lubricants, food and food packaging, and ointments. It's also relatively cheap. Researchers in Israel estimate that it would cost about 3 cents per day to provide adequate supplemental PEG for sheep.

PEG binds tannins, the type of compounds produced by nearly 80 percent of all shrubs and trees. Many tannins cause digestive upsets. Provenza has been studying tannins and food selection of range livestock for several years. Tannins either bind with proteins and carbohydrates, thereby reducing the nutritional value of feed, or damage the lining of the digestive system.

Range scientist Fred Provenza and research associate Beth Burritt with their subjects.



Gary Neuenswander

Except for the tannin content, many of the shrubs and trees are as least as nutritious as other plants eaten by livestock.

Researchers add the PEG to grains or other supplements. Only small amounts of PEG are required, usually much less than a tenth of a pound, for livestock to change their diets. Several studies have shown that "up to a certain point, the more PEG, the more intake of these shrubs increases," Provenza says.

There are hundreds of thousands of acres in the Intermountain West with nutritious but unpalatable shrubs such as bitterbrush and blackbrush where PEG could spur consumption. In Africa, adding the compound to drinking water helped livestock survive a recent drought by letting them utilize otherwise unpalatable shrubs.

The compound also promises to be a valuable tool in range management, aiding in the of control woody species that fuel wildfires.

Provenza says PEG is a natural and safe method. "If it's a tannin, PEG will tie it up. PEG is something that a producer with tannin-containing shrubs can consider using now," he says.

Much remains to be learned about use of the compound, including exactly how much PEG to offer and in what form. Amounts of PEG may also vary according to the type of rangeland, time of year, and other factors. **KG**

MORE INFO

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Recent Grants and Contracts

Don Snyder, Economics Department, is studying the economic impact of agricultural businesses in the state. He and **Christopher Fawson**, Economics Department, are also conducting an economic resource inventory and base study for San Juan County. Both studies are funded by the Division of Community Development, Utah Department of Community & Economic Development. The Utah Department of Agriculture and Millard County fund Snyder's study of the number of cull cattle available for slaughter in Utah and surrounding areas.

Richard Peralta, Biological & Irrigation Engineering Department, studies the groundwater in Cache County with funding from the Division of Community Development, Utah Department of Community & Economic Development.

Lyle McNeal, Animal, Dairy & Veterinary Sciences Department, is developing an outreach education and applied research demonstration center for the native cultures of the Four Corners Region with funding from the W. K. Kellogg Foundation.

Edward Evans, Biology Department, studies the influence of honeydew in the biological control of the western alfalfa weevil with support from the Cooperative State Research, Education and Extension Service (USDA).

Richard Joerger, Agricultural Systems Technology & Education Department, is developing a competency test for agricultural business and management, conducting a workshop on computer tools for farm and ranch management, and revising instructional modules for the curriculum in agricultural science and technology. The projects are funded by the Utah Office of Education.

The Nature Conservancy funds a study of the pollination biology of *Arctomecon californica* by **Vincent Tepedino**, Biology Department and Bee Biology & Systematics Laboratory.

Roger Kjelgren, Plants, Soils & Biometeorology Department, studies the pruning of native shrubs for maximum water utilization with funding from the Utah Water Conservation Forum.

Martyn Caldwell, Rangeland Resources Department, studies the plant response to stratospheric ozone reduction (scaling spectral responses) with funding from the Cooperative State Research, Education and Extension Service (USDA).

DeeVon Bailey, Economics Department, studies the expansion of farmers' markets in Utah with funds from the Utah Department of Agriculture.

Larry Bond, Economics Department, develops budgets and computer software related to crop and livestock production with funds from the Utah Department of Agriculture.

John Evans, Plants, Soils & Biometeorology Department, is developing an integrated approach to control jointed goatgrass in winter cereals with funds from the Utah Department of Agriculture and Washington State University.

Conly Hansen, Nutrition & Food Sciences Department, studies methods of improving the processing of trout by-products with funds from the Utah Department of Agriculture.

David Hole, Plants, Soils & Biometeorology Department, improves the end use quality of hard red and hard white winter wheats in Utah with funds from the Utah Department of Agriculture.

Bradley Kropp, Biology Department, studies the biological control of dyers woad with a pathogenic rust fungus with funds from the Utah Department of Agriculture. He also investigates the response of mycorrhizal fungi to different silvicultural treatments in the forests of northeast Oregon for the U.S. Forest Service (USDA)

Gilbert Long, Agricultural Systems Technology & Education Department, and **Dan Drost**, Plants, Soils & Biometeorology Department, study research agendas for sustainable vegetable production with funds from the Utah Department of Agriculture and the Utah Department of Environmental Quality.

Bart Weimer, Nutrition & Food Science Department, and **John Lohr**, Biotechnology Center, are developing a system of rapid identification for *Campylobacter jejuni* with funds from the Utah Department of Agriculture.

Randall Wiedmeier, Animal, Dairy & Veterinary Sciences Department, is developing a livestock production system that is less reliant on the grazing of public lands. His work is funded by the Utah Department of Agriculture.

Fred Provenza, Rangeland Resources Department, studies the behavioral bases for varied diets of ruminants with funding from the Cooperative State Research, Education and Extension Service (USDA).

John Carman, Plants, Soils & Biometeorology Department, analyzes the in-ovulo environment of Douglas-fir during the early stages of embryo development with funds from Weyerhaeuser.

Ann Austin, Family & Human Development Department, develops a child care resource and referral service for Cache, Rich and Box Elder counties with funds from the Utah Office of Child Care, Utah Department of Community & Economic Development.

The Utah Department of Community & Economic Development funds the following USU Centers of Excellence: The Center for Developmental and Molecular Biology (**Kenneth White**, Animal, Dairy & Veterinary Sciences Department), the Center for Dairy Foods Technology (**Paul Savello**, Nutrition & Food Sciences Department), and the Center for Value-Added Seed Technology (**John Carman**, Plants, Soils & Biometeorology Department).

New Faculty

Amitrajeet Batabyal is assistant professor, Economics Department. He was visiting assistant professor at the College of William and Mary, Williamsburg, Va., and earned a PhD in agricultural and resource economics from the University of California-Berkeley.

Ilka Nemere is assistant professor, Nutrition & Food Sciences Department. She earned a PhD in molecular biology from the University of California-Los Angeles and was a member of the associate graduate faculty at Marshall University, W. Va.

DIRECTOR ACCEPTS NEW ROLE, ANNOUNCES ADMINISTRATIVE CHANGES

H. Paul Rasmussen, director of the Utah Agricultural Experiment Station, has been elected chairman of the Experiment Station Committee on Organization and Policy (ESCOP) for 1996.

ESCOP represents the nation's experiment stations on regional and national issues, including federal budget legislation.

H. Grant Vest, head of the Department of Plants, Soils & Biometeorology, has been appointed half-time associate director of the Experiment Station to handle administrative matters during Rasmussen's ESCOP-related absences.

William Scouten, director of the USU Biotechnology Center, and Deevon Bailey, USU economics professor, are participating in an ESCOP-sponsored training program for faculty members interested in resident instruction and Experiment Station operations. Both will be acting associate directors of the Experiment Station during the year-long training program.

Bailey is studying the economic impact of Experiment Station research and Scouten is focusing on methods to improve communication with the state legislature.

Rasmussen said he is particularly concerned about the erosion in federal support for Experiment Station research. Federal funding has not increased during the last decade. With inflation, that represents about a 30 percent decline in its contribution, which has often been coupled with a decline in support from other sources. This year, federal budget proposals call for a reduction in federal support. Many analysts predict further cuts.

"The proposed reductions in federal support this year will result in the loss of one support position at the Utah Agricultural Experiment Station," Rasmussen said. "Reductions in funding have already affected our ability to acquire state of the art equipment. Eventually, we will lose faculty positions."

Rasmussen says the lack of funding threatens the cooperative research system which has made American agriculture the most productive in the world. As ESCOP chairman, he will stress cooperation between states and the federal government, and encourage efforts to provide information about the value of agricultural research.

Rasmussen joined the Utah Agricultural Experiment Station as associate director in 1985. He was named director in 1988 and associate vice president for research at USU in 1992. Before joining USU, he was head of the Department of Horticulture and Landscape Architecture at Washington State University. **KG**

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USU PLANS BOTANICAL CENTER

USU's Botanical Garden has been transformed into a Botanical Center—on paper at least. The actual change may take a while.

Plans call for moving the Botanical Garden at Farmington to a larger site in Kaysville. The Botanical Garden was established in 1954 and is extensively used in research, education, and training. The Botanical Center will provide more facilities and a broader range of services.

The change was prompted by the expansion of U.S. Highway 89 impinging on USU's 7-acre Botanical Garden in Farmington.

Funds are needed to create the Botanical Center, which will be a partnership between local communities, Utahns, and the "green industry," said H. Paul Rasmussen, director of the Utah Agricultural Experiment Station. Surveys show strong support for the concept by local residents and community officials.

Land exchanges and purchases resulted in the acquisition of 35 acres in Kaysville adjacent to the Experiment Station fruit research station. The site also includes 64 acres of ponds and wetlands adjacent to I-15.

In addition to the vegetables, ornamental shrubs and flowers at the Botanical Garden, the Center will incorporate other elements of the region's high desert ecosystem.

The Center will emphasize the management and conservation of water and other natural resources. Wetlands will be restored to improve the quality of the water (largely runoff) in ponds. These measures will also improve wildlife habitat.

Gary Neuenswander

The first phase, including cleanup of the site and moving plants, is just beginning. Subsequent phases call for the construction of a visitor center, educational facility, and recreational trails during the next decade.

Six USU colleges are participating in creation and operation of the Botanical Center. Students enrolled in USU's Department of Landscape Architecture and Environmental Planning developed plans for the Center. With the adjacent Experiment Station Farm, the Center will provide almost 200 acres of open space in a heavily urbanized region of the state. **KG**

More info

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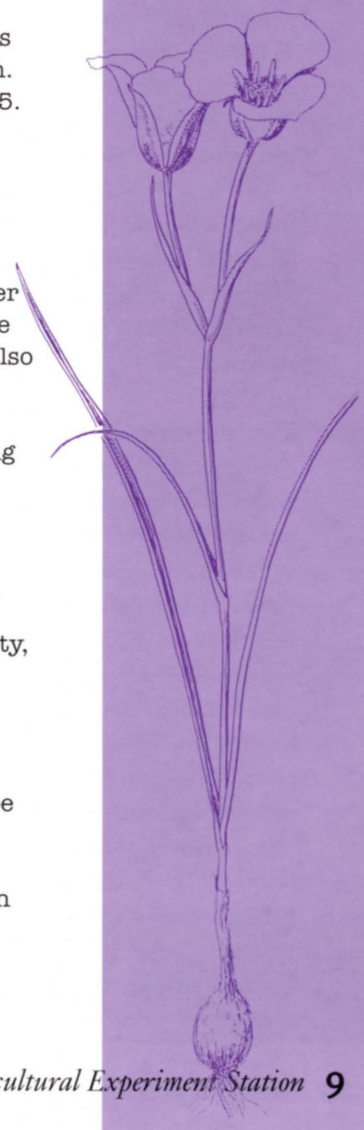
In addition to the vegetables, ornamental shrubs and flowers at the Botanical Garden, the Center will incorporate other elements of the region's high desert ecosystem.



Turfgrasses May Simplify Lawn Care

Irrigate. Mow. Irrigate. Mow. Irrigate. Irrigate. Irrigate. Irrigate.

So it goes all summer with Utahns and their Kentucky bluegrass lawns. Usually around the middle of July, many homeowners realize that both they and their lawns are frazzled.

"Kentucky bluegrass makes a great lawn when it's well maintained, but it's not heat or drought tolerant. It's a struggle to keep it looking good between June and August," said USU turfgrass researcher Eric Miltner.

Indeed. Only frequent irrigation keeps Kentucky bluegrass from reverting to an embarrassing brown summer dormancy. Tall fescue may be a much better alternative for the hot, dry months of a Utah summer.

The tall fescue he has in mind isn't the large, coarse plants that now occasionally appear in lawns. Miltner says new turf-type varieties offer suitable color and density, and except for slightly wider leaves, are nearly indistinguishable from Kentucky bluegrass. Its deep roots (a depth of 3-4 feet vs. 12-18 inches for Kentucky bluegrass) mean tall fescue requires much less frequent irrigation than Kentucky bluegrass. Miltner will also determine whether fescue can extract more of the water bound to soil particles. If so, this water-extraction ability would reduce fescue's total irrigation requirements.

Perhaps Utahns will take a page from Nebraska, where the popularity of Kentucky bluegrass lawns has been surpassed by tall fescue during the past decade.

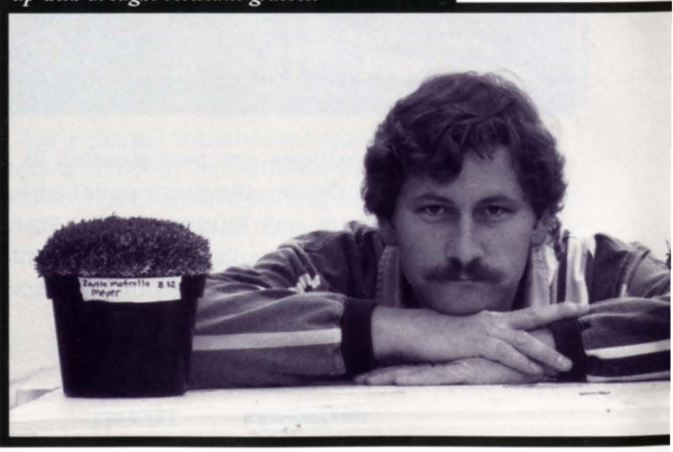
A Grass for All Seasons

Grasses are usually classified as either cool season or warm season grasses, based on their physiology and climatic adaptation. Tall fescue is a cool season grass ideally suited to the "transition zone," an area between the cool and warm climatic regions. Miltner says tall fescue is nearly ideal for Utah conditions.

"Utah is a challenging climate for some grasses because of the temperature extremes, which can vary 130 degrees from winter to summer. Warm season grasses can't survive the winter while cool season grasses struggle to survive the summer," Miltner said.

Miltner is studying the drought tolerance of several types of turfgrass, including tall

Researcher Eric Miltner uses his head to come up with drought resistant grasses.



Gary Neuenswander

fescue, Kentucky bluegrass, perennial ryegrass (often used on golf courses), zoysiagrass, buffalograss, and crested wheatgrass.

Zoysiagrass is an extremely drought-tolerant warm season grass, similar to bermudagrass, that thrives at temperatures from 85 to 95 degrees. It generally goes dormant after the first frost and doesn't usually green up until mid-May. It's considered the most cold tolerant of the warm season grasses .

Buffalograss, a cold-tolerant native of the Great Plains, is another promising warm season grass that's become popular in the Denver area. Zoysiagrass and buffalograss may be suited to southern Utah.

There are several other grasses that require even less pampering, including turf varieties of crested wheatgrass developed by Kay Asay with the Forage and Range Research Laboratory in Logan. Sodar streambank wheatgrass is a variety suitable for areas that are neither irrigated nor mowed.

For the moment, however, Kentucky bluegrass still reigns supreme in the state, even during the state's long, hot summers when other grasses could make our lives easier and just as green. **KG**

MORE INFO

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Lawn Thatch a Sponge for Excess Nitrogen

The lavish fertilization of lawns is often blamed for letting nitrate seep into groundwater. The accusation is repeated so often that it's viewed as fact.

It's not necessarily so.

While a graduate student at Michigan State University, USU turfgrass specialist Eric Miltner studied the fate of nitrogen applied to lawns at rates commonly used for high maintenance turf. Surprisingly, nitrate leached into groundwater only on sandy soil that had been overwatered. Nitrate did not leach through medium-textured sandy loam soil.

In a single growing season, Miltner found 30 to 40 percent of the nitrogen is taken up by grass. The rest of it is metabolized and cycled by the rich microbial population in the upper layer of soil. The mineralization of inorganic nitrogen by microbes prevents leaching but also reduces its availability to plants.

Most of this "excess" nitrogen is retained in the thatch layer, which acts like a nitrogen sponge, mineralizing and then slowly releasing nitrogen. Cycling of nitrogen occurs in all plant communities, but it appears to be particularly active in turf, due to its high organic matter, a phenomenon that Miltner continues to study..

It's best to retain this nitrogen in grass blades by not removing grass clippings, which provide about a pound of nitrogen for every 1,000 square feet of lawn. (A common misconception is that clippings add to the thatch layer. However, thatch consists largely of the rhizomes, roots, and crowns of plants, which decompose more slowly than clippings.)

So as long as homeowners stick to recommended fertilization rates and don't flood lawns after fertilization, they shouldn't be contributing nitrate to groundwater.

COVER STORY

PARTICIPATION CAN DEFUSE NATURAL RESOURCE CONFLICTS

Harried employees of public land agencies, beleaguered ranchers, agitated recreationalists, outspoken politicians—everyone seems to have an opinion about the management of public lands in the West.

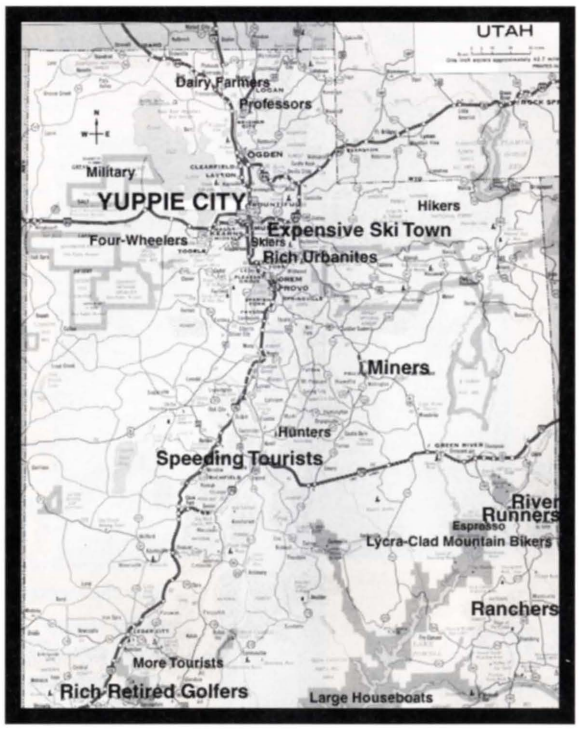
Everybody also seems to have an opinion (usually unfavorable) about everyone else's opinion. In the midst of this swollen debate, a USU researcher says he detects ample opportunities for consensus.

Mark Brunson, a forester who studies the human dimensions of natural resource management, says people often misjudge the opinions and motives of their adversaries, exaggerating differences and minimizing areas of agreement. In part, this reflects poor communication. In part, it reflects a fear that their opinions won't be considered.

In other words, people react as if they knew what others think. They often don't.

INACCURATE MENTAL MAPS

"Those who manage land or a resource make mental maps of the socio-political terrain, just like they map the physical terrain. But these maps are based on limited experience, and may not be very accurate," Brunson said.



These misperceptions have several ramifications, including the failure to adequately convey the management options in terms the public understands.

Consider public rangelands. According to a recent survey by Brunson and other researchers, most members of the general public who were surveyed agreed with statements (one of several possibilities) stating that the condition of upland rangelands has deteriorated during the past 50 years. Most range managers probably think otherwise.

The general public also tended to agree with a statement attributing much of the putative decline to overgrazing. While overgrazing can occur and can adversely affect rangeland, it probably occurs to a much smaller extent than the public perceives.

While some land managers might view this gulf as a reason for despair, Brunson said the findings clearly indicate the need for public participation.

"We deal with complex issues, which usually don't have simple solutions, although the political process tends to favor simple solutions. However, the public usually makes reasoned choices if they understand the issues," Brunson said.

Sometimes, disagreements have been fostered by the decision-making processes employed by public agencies, the culmination of legal processes and bureaucratic procedures that inadvertently discourage full public participation and hamper clear explanations of the reasons for decisions.

Learning the views of the public and of stakeholders can facilitate communication. It doesn't mean public opinion will dictate resource management policies, however.

"OWNERSHIP" OF DECISIONS

"Basically, the public wants some ownership in the decisions that affect them. They recognize that there will be winners and losers in any decision, but even those whose views don't prevail want to know their views were considered and that there's a good reason for decisions.

"Open decision-making mitigates concern," Brunson said.

Room for agreement is evident in several surveys Brunson and Allen Rasmussen, USU range Extension specialist, have conducted. For example, ranchers in Utah who were recently interviewed about their opinions of "ecosystem management" usually start by

expressing fear about the loss of property rights and threats to their livelihood. However, they also acknowledge that the concerns of other users of public lands deserve to be heard, but worry that their rights as ranchers won't be similarly respected by others.

Another survey conducted by Brunson and Robert Schmidt, USU wildlife researcher, asked respondents to rate the factors that they thought should influence decisions about methods to control wildlife damage. Surprisingly, most rated public opinion as one of the *least* important factors.

Attitudes toward issues such as rangeland management tend to reflect a person's attitudes towards other environmental issues, such as ozone depletion and tropical deforestation, and may not be very malleable, Brunson said. Resource managers are unlikely to affect opinions about these issues, but should realize people are receptive to credible information from impartial sources, such as land-grant universities.

CONFLICT IS INEVITABLE

Conflicts are a part of natural resource management, Brunson said. "People recognize the need for change. What they want is change at a rate that they can accommodate, and by a process that lets them participate.

"The answer may lie in collaborative decision-*building*, which differs from the more commonly used term of collaborative decision-making, because it recognizes that federal agencies must still make these decisions. It's the equivalent of walking the land together, a chance to hear each other's viewpoint and to take a firsthand look at the evidence."**KG**

MORE INFO

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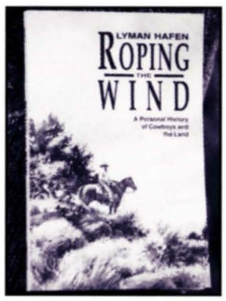
A literary view of the natural resource conflict:

cowboy and writer Lyman Hafen interviews environmentalist and writer Edward Abbey

excerpted from Lyman Hafen's recently published book, Roping the Wind.
Available from Utah State University Press, 1-800-343-3444



At the time

I didn't know a fresh Edward Abbey essay had just appeared in *Harper's* a long polemical piece which brutally assassinated the character of anyone who ever swung a leg over a saddle and rode in the dust of a cow. I suppose I should have expected it. I knew nothing was sacred to Edward Abbey, not even cows. But I possessed a monumental weakness where Abbey was concerned: in spite of the fact that I took issue with much of what he wrote, I greatly admired the way he wrote it. That's why I went to Moab.

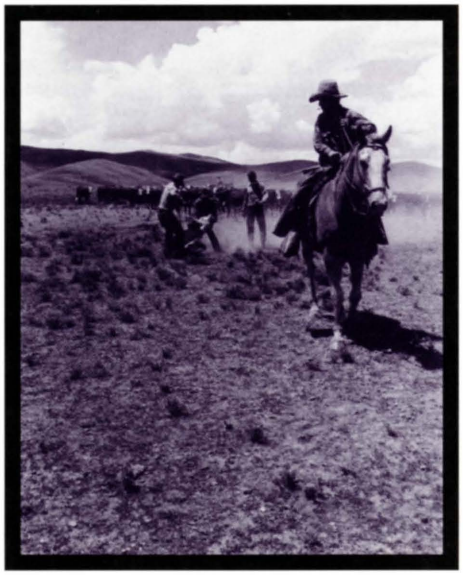
Edward Abbey was backlit by midafternoon sun as he stepped into the lobby of Pack Creek Ranch. He was taller than I remembered and not quite so lean. I arose from my seat on the nauga-hide couch and could almost feel him size me up with eyes that wore a permanent, scrutinizing squint. I had met him once before. It had been a quick, small-talk session that began with a limp, halfhearted handshake. This time the interview was prearranged and the venerable writer seemed to offer me a bit of benefit-of-the-doubt credibility. His elfin face transfixed into a full smile as he shook my hand, firmly this time. His salt-and-pepper-beard was fluffy like a not-too-serious rain cloud, and he had on a short-sleeved western snap shirt, beige Levi's and plain bullhide boots with some miles on them.

He came across as very kind and I caught myself wondering if this could be an imposter, if this outwardly cordial fellow could truly be the curmudgeon who brazenly bashed so many of our national icons. The two of us sat down on the lobby chairs—along with our host Ken Sleight and my friend Milo McCowan, the real estate developer and book collector who had arranged the meeting—and began a conversation that lasted for six hours.

Right out of the gate, any lingering question of false identity was left abruptly in the dust.

Abbey slipped to the rail and settled in our issues of particular interest to him at the time. He criticized the National Park Service for transforming many of our most popular parks into mini metro centers. He damned the damnation of Glen Canyon and lauded Larry McMurtry's recent *Lonesome Dove*. He praised another novelist, a fellow from El Paso named Cormac McCarthry whose work he had just discovered (this a full five years before *All The Pretty Horses* and the ensuing Border Trilogy). He also set forth his proposal for legislatively limiting population, suggesting we seal off all our borders to immigrants.

It was inevitable that on the backstretch and final turn, our conversation would ultimately grind down to cattle and the public lands. It was Abbey's race and he held his half-length lead wire to wire. He knew I was the son of a rancher who, like most others in our region, depended to some degree on use of the public range. Still, he held nothing back. He plowed down the homestretch with the same reasoning, the same vitriolic rhetoric, and many of the same patented Abbey phrases that I would read a short time later in his essay. "There's the cowboy and his cow," said Abbey. "Some of these cattlemen are nothing more than welfare parasites. They've been getting a free ride on the public lands for over a century, and I think it's time we phased it out. I'm in favor of putting the public lands livestock grazers out of business."



I had figured I was prepared for most anything Abbey might throw. But this one brushed me back. My throat went dry as a desert wind. Obviously I did not agree. I wondered if he was testing me. I knew that Abbey was always one to rile things up—throw a fly in the ointment—just to get your attention. Surely he was joking. But he didn't flinch. He was serious. "We don't need the public lands beef industry," Abbey said. "The vast majority of our beef in grown on private land in the Midwest and South and East-where you can support a cow on half an acre rather than the twenty-five to fifty acres it takes to sustain a cow on the public lands of the West." I'd heard his facts before. It was not the facts I disputed so much as the way he strung them together—and the facts that he conveniently avoided.

"Furthermore," Abbey went on, "we'd save money in taxes we now pay for various subsidies to these public lands cattlemen. Subsidies for things like range improvement—tree chaining, sagebrush clearing, mesquite poisoning, disease control, predator trapping, fencing, wells, stock ponds, roads."

It was my turn now. "The last time the Bureau of Land Management cleared any sagebrush for my father, a rancher from Texas was president," I countered. I added that the only range improvements made on his public range allotment in the last ten years had been made largely at his own expense—to the tune of more than $20,000.

But Abbey was on his soapbox now. "Cattle are doing intolerable damage to our public lands," he said. "Almost anywhere you go in the American West you find hordes of these ugly, clumsy, stupid, bawling, stinky, fly-covered, sh**-smeared, disease-spreading brutes. They are a pest and a plague."

My chest swelled. No wonder the tables were turning. No wonder the BLM was cutting range rights every year, putting range improvements on hold, and generally making life miserable for folks trying to hold onto their investment and to a way of life in the public lands. No wonder so many ranching families were selling out after four or five generations in the business. I couldn't come up with an eloquent counter to Abbey's diatribe. My defense floated in some vague notion at the heart of the myth he was talking about: that we are choking out one more productive way of life, leaving the land and flocking to the office where the only thing we produce is paper for the recycling bin.

I suppose Abbey was reading my mind. He came back with this: "It's not easy to argue that we should do away with cattle ranching. the cowboy myth gets in the way. But if all of our 31,000 public land ranchers quit tomorrow, we'd never miss them."

"*You* wouldn't," I said. "But I miss a whole bunch of them already. Guys like Waldo Simkins, Aaron Leavitt, Mark Cannon, Levi Snow. They're all gone now, and nobody replaced them. Their sons headed into more promising futures; the cows were sold off; their private property was optioned for real estate development; all those generations of ranching, of production, of wealth generated from a renewable natural resource—all of it ended just like that." I could think of dozen sons of ranchers I graduated from high school with in 1973. None of us stayed in ranching. Not so much because we didn't want to, but because we could see easier and more lucrative ways to make a living. Over the past twenty years, cattle numbers on the public ranges have fallen by the thousands as one ranching operation after another has faded. My father, and others like him, saw it coming for a long time. they sent their sons to college and trade schools—talked them into dentistry, diesel mechanics, financial

planning, medieval literature. "There's no future on the ranch," my dad once told me. "If cattle prices or drought don't bury you, the government will."

Abbey railed on and I was stuck there like a trapped coyote. No choice but to listen. He suggested a few methods for reducing cattle on the public ranges—Abbeyisms like declaring a hunting season on range cattle or stocking water holes with alligators. I figured he had said just about every disparaging thing possible. Then he started to get more personal. "Most ranchers don't work very hard," he said. "They have a lot of leisure time for politics and bellyaching. Anytime you go into a small western town you'll find them at the nearest drug, sitting around all morning drinking coffee, talking about their tax breaks."

It was obvious now that Abbey's cowboy and mine were two different breeds. After reading his essay later, I learned that the cowboy image he had fixed upon was cut from the pattern of a no-account, drunken New Mexican he had known back in 1947, who took potshots at jackrabbits and road signs with a .44, and let his 40 acres go to tumbleweed. My image came from somewhere else. It was shaped by men like Levi Snow, a slight, gentle, competent man who spent his days eking a living off the desolate range along the Beaver Dam Slope in Southwestern Utah and Southern Nevada. Abbey's cowboy was expletive, lazy, and antisocial. Mine was a hard-working man with a set of ethics, some civicmindedness, and a modest fear of God.

I had sense enough to know that most cowboys fall somewhere between the two extremes. I also knew, and was willing to concede, that there have been plenty of cowmen who have made mistakes, who whether through greed or ignorance or even laziness have damaged the land and left behind a sad legacy. But I believed that more of them fit my definition than Abbey's. Of the two dozen true cowboys I had known, all of them built in the mold of Levi Snow, none vaguely resembled the slouch Edward Abbey planted in the minds of a quartermillion *Harper's* readers.

I wanted somehow to share Levi Snow with Edward Abbey. I wanted to tell him that I didn't believe Levi ever sat at the counter of a drugstore. That he wouldn't have had time for politics or bellyaching. That he had cows out on the slope which he tended like children, hayfields to mow and rake and bale, fences to mend, calves to wean, ditches to dig, horses to break, strays to gather, ice on ponds to break, grazing fees to pay, taxes to catch up on, rain to pray for, buyers to see, cattle to move, trucks to load, flats to fix, and bills and bills and bills to pay. But I didn't know how to tell him; or maybe I just didn't have the courage.

Yet the image was there, alive and burning on the ridges of my mind. The image of a good and caring man who started every day before the sun, whose quitting time was when everything was done. He had a home and a family in town, but he spent most of his days on the range, camping in a dugout or a line shack or under the stars. He grazed his cattle mostly on the public range, when and how the BLM and Forest Service mandated, and tried his best to make an honest living.

Abbey, I was certain, would have been unaffected by my description. He continued with zeal, "We don't need cowboys or ranchers anymore," he said. "We've carried them on our backs long enough."

I sank into memories. Struggling to protect myself from Abbey's flaying, I recalled a dark rainy spring day nearly twenty years earlier. Where I came from rain's the greatest gift, the only gift I ever heard my dad ask for. (I do remember one time when he wished for a million dollars. "What would you do with a million dollars?" I asked. "I'd run cattle until it was all gone," he said.) We were pushing cows up the mountain, up the steep road through Ash Spring toward Bunker Peak. We had two hundred head of bolly-faced cows ahead of us, the best horses in the county beneath us, and a million gallons of water toppling down upon us. Soaked to the bone, we drove those cows up the mucky winding road to summer pasture and the old cowboys hummed and told stories all the way. Levi Snow is the one I remember best from that day. He was short, lean, wouldn't have weighed more than a hundred and a quarter. Kindest eyes I ever saw. Levi was so small some of the other cowboys complained that it wasn't fair; he could weave between the raindrops and not get wet. he wore a tan slicker that covered his frail frame and hung down over his saddle like a dress. His wide-brimmed hat, water trailing off the back, kept his face and ears dry. It was cold and uncomfortable and not an easy thing to be doing. But he was happy.

"We don't need ranchers anymore." The force of Abbey's voice hit me like a two-by-four across the side of the head. "They've had their free ride. It's time they learned to support themselves." When Abbey finally finished, I mustered one last question. He had earlier complained about his modest earning as a writer, and I wanted to know what he would do if he fell into a large sum of money. He thought for a moment, undoubtedly mulling over the paradoxes that underlie his legend. His face, lit by an old wagonwheel lamp, slowly formed a facetious grin and finally he said, "I'd probably buy myself a ranch." **LH**

Microbes to Aid Manure Management

Here's some simple arithmetic about livestock manure:

A mature dairy cow produces more than 20 tons (wet weight) of manure annually, which means that the dairy cows in Utah (more than 80,000) produce more than 1.5 million tons of dairy manure annually. That's in addition to the wastewater, bedding and other materials that usually accompany manure.

Gary Neuenswander

Jenny Norton ponders a repository of nutrients.

That's a lot of waste. And the demand for raw manure...well, it's a buyer's market.

For hundreds of years, farmers relied on manure as a source of nutrients. The nutrients are still there, but shrinking farmland and the consolidation of livestock production can sometimes add up to enough waste that, if improperly managed, can become a significant source of pollution.

Ultimately, manure usually ends up on land, preferably in a manner that either retains nutrients in the soil or releases them for use by crops. With excessive or improper application, nutrients (especially nitrogen) and pathogens slough off into rivers, streams or groundwater.

The increased popularity of confinement livestock production (and the accompanying concentration of wastes) and dwindling farmland mean that it's more difficult to apply manure at agronomic rates.

Control Nitrate Production

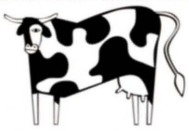
USU soil microbiologist Jenny Norton thinks controlling bacterial processing of nutrients in manure is the key to successful management. Nitrifying bacteria convert the nitrogen in animal wastes to nitrates. In compost heaps or soil, the goal is often to inhibit nitrification so any nitrate that is produced is rapidly utilized by plants. In manure-storage systems, the goal may be the opposite—to accelerate the production of nitrates, which anaerobic bacteria then convert into a gas that is released into the atmosphere.

Several Strains Exist

Norton is identifying bacteria that may be suited to these purposes.

There are many strains of these nitrifying bacteria (perhaps thousands), only a few of which have

If 1  = 20 Tons Manure *then*

80,000  = more manure than you know what to do with

even been named, much less characterized. Strains that differ in their ability to nitrify wastes could be added to accelerate (or retard) nitrification, much as sewage treatment plants "seed" waste-treatment ponds with activated sewage sludge.

Norton studies a gene in 10 strains of bacteria that encodes a key enzyme involved in the production of nitrate from ammonia. (Most nitrogen in manure occurs as ammonia).

"Some strains of these bacteria contain several copies of the gene that encodes for the enzyme. We don't know whether these multiple copies increase the rate of nitrification or if they encode for different enzymes at different concentrations of ammonia," Norton said.

Nitrifying bacteria are also rather sluggish and multiply more slowly than many other types of bacteria. It might take nitrifiers two or three weeks to equal the numbers that *E. coli* achieve overnight. Determining what conditions favor the growth of the right type of waste-processing microbes could improve the management of manure-storage systems.

Although manure has considerable value as fertilizer (the manure produced by a cow annually contains about 180 pounds of nitrogen, one-third of which is available to plants the first year), uncertainty over the availability of these nutrients often means farmers overfertilize fields.

Understanding the factors that control the release of nitrogen from organic materials and the subsequent nitrification would maximize use of these nutrients as well as curb the risk of pollution.

Norton's interest in waste-processing bacteria includes composting to process raw manure. She also studies the fate of bacteria in the soil following repeated applications of N-Serve, a commercial product that binds to ammonia oxidizers to slow the release of nitrogen in ammonium nitrate. Norton is determining whether repeated applications of N-Serve on grain fields have altered the types of soil nitrifier populations.

Manure may not be a hot commodity, but the nutrients in manure are valuable, Norton said. And managing manure to increase it's value, either through composting or some other method, doesn't require sophisticated management.

It takes a little time, space, labor, air—and the right types of bacteria. **KG**

MORE INFO

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Native Grasses Offer Diversity and Utility

Sleepygrass reaches gigantic proportions, is relatively unpalatable, and, as its name implies, it makes horses sleepy after they ingest it.

What possible use is there for an inedible grass with such improbable attributes? As it turns out, plenty, thanks in part to legislative mandates governing the reclamation of disturbed lands.

Legislation requires that many mined areas in the West must be restored with native species. Many of these areas are also subject to grazing by wild horses. Tenacious and unpalatable sleepygrass appears to be one of the few plants that could survive these inhospitable conditions without being decimated by overgrazing, said Tom Jones, a geneticist with the USDA's Forage and Range Research Laboratory.

Sleepy Grass
Stipa robusta
Dry plains and hills & dry open woods

Sleepygrass's ability to deter grazing by livestock and wildlife will also be useful in protecting stream banks and riparian areas and reducing roadkill by discouraging congregation along highway rights-of-way.

Jones has 96 collections of sleepygrass from Colorado, Montana, New Mexico, Arizona, and Wyoming. A fungus (endophyte) that lurks in sleepygrass produces alkaloids related to lysergic acid that are believed to deter grazing and result in drowsiness. Researchers with the USDA's Poisonous Plants Research Laboratory, Dale Gardner and Terrie Wierenga, are cooperating in a study of the sleepygrass alkaloid.

Sleepygrass, a native species found in several Western states, is one of 11 native grass species that Jones studies. All possess some desirable attributes such as drought-hardiness that make them candidates for release as varieties. All species also have problems, such as seed shattering, that warrant improvement.

The popularity of many introduced grasses, such as crested wheatgrass, often reflect their grazing tolerance. Most introduced grasses evolved under heavy grazing pressure in Eurasia. Native grasses experienced relatively light grazing pressure, and hence are usually less grazing tolerant.

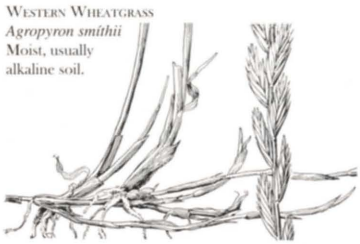
Natives have other desirable attributes, however. One promising native grass is bottlebrush squirreltail, a short-lived perennial whose life cycle is similar to that of cheatgrass. When planted on the periphery of an infested site, bottlebrush squirreltail plants will disperse seeds into the infestation, thus competing effectively against cheatgrass or medusahead wildrye.

Cheatgrass
Bromus tectórum
Along roadsides, banks, and waste places.

Efforts to restore or maintain biodiversity have encouraged the use of native plants in reclamation efforts. Jones said plant breeders and restoration ecologists often view the issue from different perspectives. Plant breeders recognize the common genetic origins of native and "introduced " grasses. Restoration ecologists tend to emphasize the geographical origins of grasses.

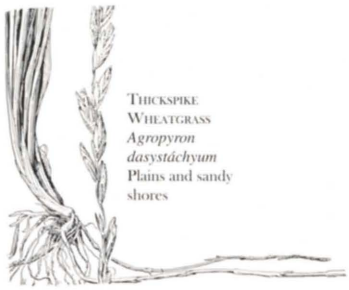
"The preference for native or introduced grasses has utilitarian as well as policy aspects. The utilitarian aspect involves the ability of a plant to

meet a particular need or use, and the distinction between introduced and native grasses is blurred. The distinction between native and introduced species is very real when it concerns public policy, however," Jones said.

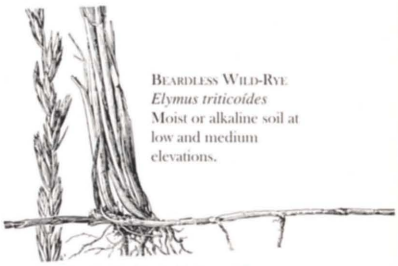

WESTERN WHEATGRASS
Agropyron smithii
Moist, usually alkaline soil.

Relying only on native seed sources collected "on site" can increase costs of restoration, particularly when attempted on a large scale, Jones said. He thinks seed sources should be selected on several attributes, one of which is geographical origin.

Some National Park Service projects utilize only seed from native plants located in the immediate vicinity of a restored site. Such a "site-specific" approach can be very expensive. "My gut feeling is that restoration on a large scale is more feasible over the long term if we use materials that are generally adapted rather than site-specific," Jones said.


THICKSPIKE WHEATGRASS
Agropyron dasystachyum
Plains and sandy shores

Jones is also trying to improve the productivity of the native western wheatgrass, which is relatively productive in the Great Plains but not in the Great Basin. This wheatgrass is believed to have descended from hybrid progeny of thickspike wheatgrass and beardless wildrye. Thickspike wheatgrass is closely related to Snake River wheatgrass. Beardless wildrye is closely related to Great Basin wildrye.


BEARDLESS WILD-RYE
Elymus triticoides
Moist or alkaline soil at low and medium elevations.

Illustrations from Manual of the Grasses of the United States, USDA Misc. Publication #200

The close genetic relationships between these grasses facilitates the effort to increase genetic diversity by hybridization. Hybrid populations may be useful in developing a western wheatgrass that is both productive and adapted to conditions in the region. **KG**

MORE INFO

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What's in a name. . .

The common names of many native grasses often reflect their most important or noticeable attributes. Nefarious **cheatgrass** (*Bromus tectorum*) dries up by early summer, cheating ranchers of forage. **Indian ricegrass** (*Oryzopsis hymenoides*) is a short-lived perennial with rice-like floral branches that produced seed collected by Native Americans. **Basin wildrye** (*Leymus cinereus*) is a perennial found in areas flooded by ancient lakes with a flower structure similar to rye. As might be expected, **green needlegrass** (*Stipa virdula*) has bright green foliage and a seed with a sharp, pointed base. And **bluebunch wheatgrass** (*Pseudorogneria spicata* ssp. *intermis*) grows in bunches that often have a blue cast. Its flowers are structually similar to those of wheat.

USU Aids Fresh Vegetable Production

Crunchy cucumbers, crisp corn, juicy tomatoes—thousands of residents along the Wasatch Front prowl side roads for stands selling fresh vegetables. Hundreds of local producers are willing to oblige.

Gary Neuenswander

It can be a lucrative enterprise, and the prospects for growth appear promising. It's also an enterprise with demanding production requirements and considerable uncertainty.

USU is providing more assistance to this segment of the industry. One of the first steps is to determine how large it really is.

Extension vegetable specialist Dan Drost and agricultural educator Gilbert Long are surveying growers to determine the extent of vegetable production in the state. Questions also concern the types of information and assistance needed by growers, information that will be used in planning research and extension efforts.

A Lack of Statistics

Compared to other aspects of agriculture, relatively little is known about the state's vegetable production. Currently, statistics are compiled only on the leading vegetable crops—onions (about 2,200 acres worth $5.8 million) and potatoes (about 6,100 acres worth $9 million).

The production of other "minor" commodities such as sweet corn and melons appears to be increasing as growers capitalize on high demand and high prices. (In some areas, sweet corn prices reached $2.00 per dozen this year).

Gary Neuenswander

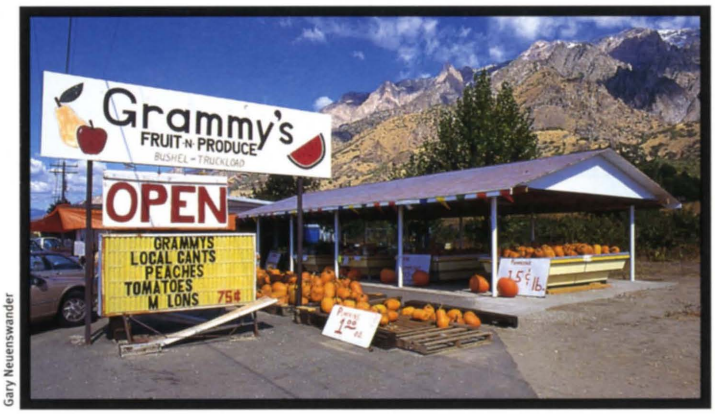
Gary Neuenswander

Selected vegetable growers will be contacted by mail and telephone surveys to compile information about the production of onions, potatoes, sweet corn, melons, tomatoes, and other vegetable crops.

Drost hopes growers will eventually form an association to facilitate educational efforts, to participate in on-farm

research, and to represent their interests in legislation and other matters.

One looming issue—population growth. Some fear urban development in Utah County and the Layton area, two major areas of this type of vegetable production, will eventually lead to restrictions on agricultural operations.



Gary Neuenswander

Drost says vegetable growers rank high in the sustainability of production, as gauged by the efficient use of resources, and the level of production and profitability. "Growers conscientiously minimize production inputs, which are major costs. It's also difficult to meet the regulations associated with pesticide use while providing consumers with blemish-free produce."

Gary Neuenswander

Gary Neuenswander

Timely information about pesticide use, fertilization, variety selection, disease control, and other production and marketing practices, should result in ample fresh produce for discriminating palates.

The survey is supported by the Utah Department of Agriculture and the Utah Department of Environmental Quality.

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Student Spotlight

It's not all hyperbole, this talk about changing occupations during a career.

Just ask Robert Fife, who's now working on his doctorate in food science after more than 12 years in the food-processing industry. His experience reflects a growing trend for college graduates to return to college.

"Regardless of their degrees, students will probably have to retrain themselves 10 or 15 years after graduation in order to keep up with technological change," Fife said.

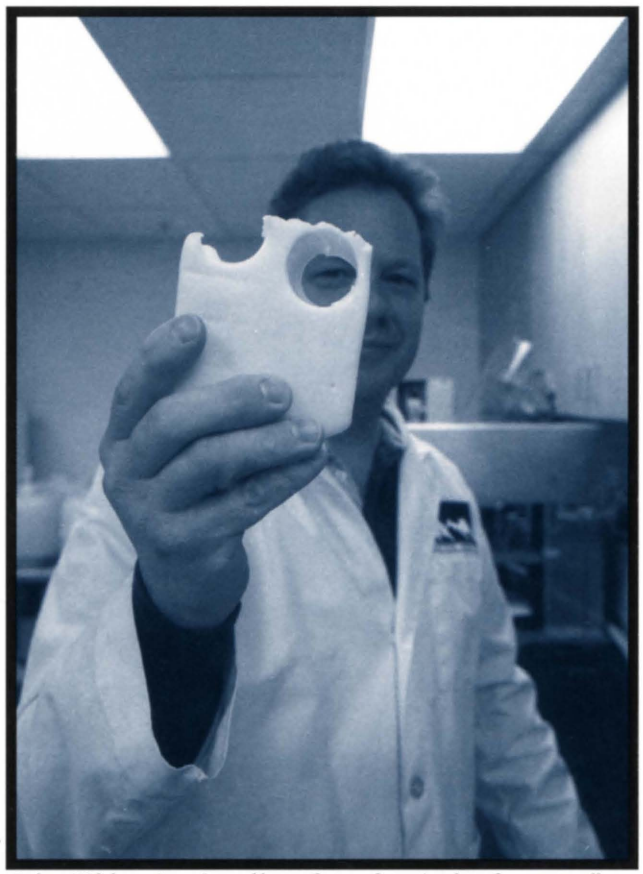
Food processing continues to generate jobs, but Fife said shrinking research and development budgets, and technological advances place a premium on honing skills.

Fife became worried about his ability to compete when he was almost 40, married, and with three children. He had weathered several job changes—some were promotions, others weren't—and had seen some highly respected colleagues get sacked after several decades of loyal and productive service because they were perceived as failing to keep up with the latest technology.

"The need to keep up with new developments is true in all fields, but it's especially true in food science where there's an astronomical failure rate for new products. Only one of 99 new food products survives more than a year.

"I was convinced that I had an obligation to retrain myself in order to ensure my continued employment during the next 25 years," Fife said.

So he did. Two years ago, he returned to USU to study methods of manufacturing low-fat mozzarella cheese with food scientist Don McMahon. The popularity of mozzarella-topped pizza and the interest in paring calories make this one of the hottest research topics in the industry. And it should keep Fife on top of the job market.



Gary Neuenswander

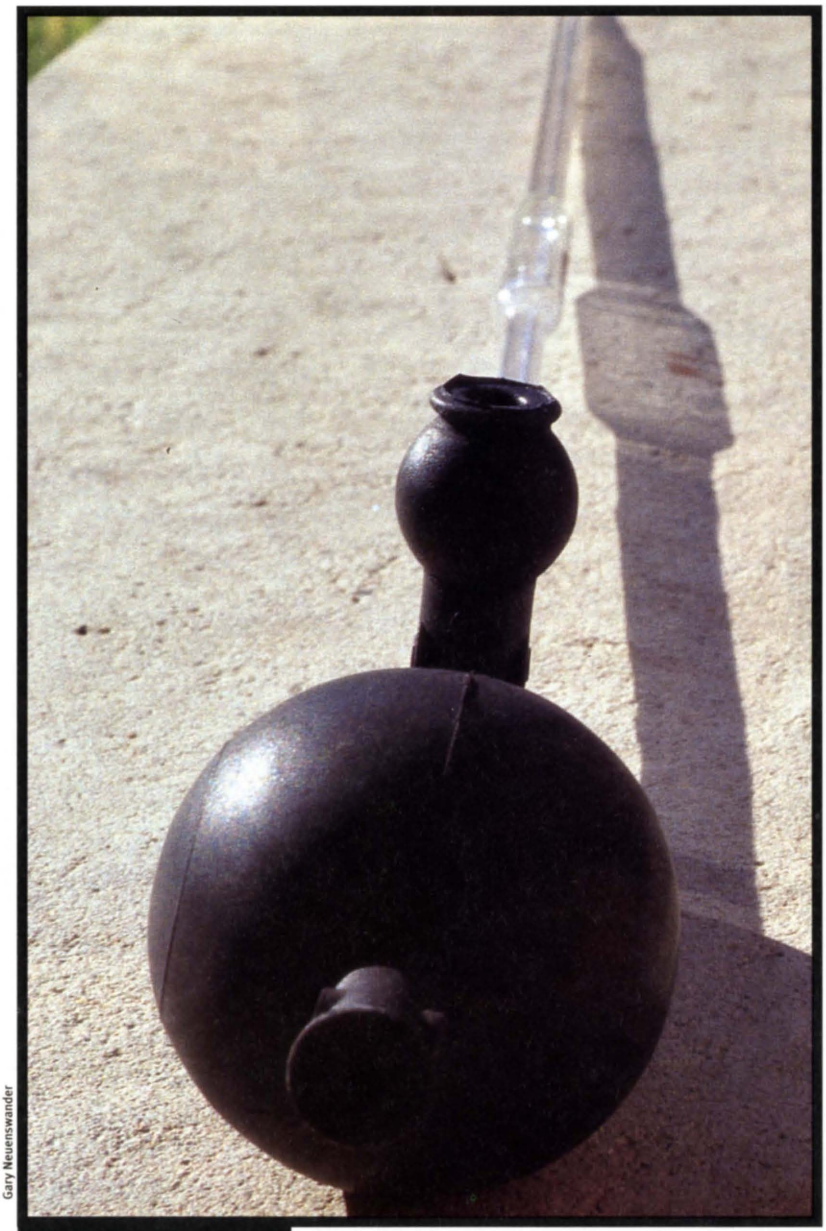
Robert Fife bores into the problems of manufacturing low-fat mozzarella.

Fife said his ability to focus on objectives has been a decided advantage in his return to school.

After earning a BS from USU in biology in 1979, Fife decided to get an MS degree in food science, in large part due to the rave reviews of a friend about the knowledge of chemistry of food scientist Rodney Brown, now dean of the USU College of Agriculture. Fife accepted a job in quality control with a California firm before he completed his degree.

"I wish I knew then what I know now. I probably would have completed my MS degree, and perhaps continued on for my Ph.D."

Nonetheless, Fife and thousands of other USU students prove education is often a lifelong process. **KG**



Gary Neuenswander

PHOTOQUIZ

Clue: A common item in research laboratories. Answer in next issue.

Answer to last issue's photoquiz: Millstone

Editor's Note

Decades ago, we had our own peculiar sort of natural resources conflicts. As farm kids, we were hardened veterans of manure lugging, bale tossing, and weed pulling. Our visiting city cousins found our circumstances interesting. Amusing. We viewed them as dilettantes. Coddled. They liked the pigs but never had to shovel the manure. They romped in haystacks but participated only feebly in the making of them. They saw gardens as the munificence of nature. We saw rows to hoe, weeds to pull and—yuck—vegetables to eat. We chopped the heads off chickens and ate the meat and thought nothing of it. They found the behavior brutish and barbaric.

We did not dislike our city cousins but were irritated by their ability to find pleasure in this sea of work. Once we told them to sit outside while we poured a yellow liquid on them from the second floor of the house. It was Jello but we said was from cows. They left early that summer. Our parents were appalled. We did not understand all the fuss. How could ersatz cow urine be so bad when we were allowed frequent and intimate contact with the real thing?

I now have a small house and a tiny, tidy yard. There are no thistles or pigs. None of my neighbors smells anything remotely like manure. Nearly everyone (including me) is a city cousin.

I should have been kinder to my city cousins. However, I still harbor some of these same malicious urges. The pursuit of "clean" recreation in rural areas usually involves the hemorrhaging of prodigious amounts of plastic, paper, and gasoline.

It is environmental carnage, but it is disguised. On the other hand, there's no mistaking a manure pile for something else.

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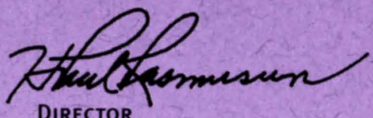

Director